



Factors contributing to coronavirus disease 2019 vaccine hesitancy among healthcare workers in Iran: A descriptive-analytical study

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ABSTRACT

Background: Despite the easy availability of coronavirus disease 2019 (COVID-19) vaccination services for healthcare workers (HCWs), some of them hesitate about receiving the vaccine. The aim of this study was to assess the factors contributing to COVID-19 vaccine hesitancy (VH) among HCWs in Iran.

Methods: This cross-sectional descriptive-analytical study was conducted in 2021–2022. Participants were 551 HCWs selected through systematic random sampling from four leading university hospitals in Zanjan, Iran. A demographic questionnaire and a 36-item COVID-19 VH questionnaire were used for data collection. Data were analyzed using the SPSS software (v. 20) and through the independent-sample *t*-test, the one-way analysis of variance, and the multiple linear regression analysis.

Findings: Participants' age mean was 34.40 ± 7.77 years and most of them were female (65.9%) and married (70.8%) and had university education (88.6%). The mean score of VH was 96.29 ± 12.88 (in the possible range of 36–180), 79.49% of participants had moderate VH, and 17.42% of them had high VH. COVID-19 VH had significant relationship with organizational role, history of chronic disease, COVID-19-related knowledge, history of COVID-19 vaccination, and history of colleagues' or relatives' death after vaccination ($P < 0.05$). The significant predictors of COVID-19 VH were COVID-19-related knowledge ($\beta = -0.113$; $P = 0.008$) and history of COVID-19 vaccination ($\beta = 0.165$; $P < 0.001$).

Conclusion: COVID-19 VH among HCWs is moderate to high, nurses have the highest VH, and the significant predictors of VH are COVID-19-related knowledge and history of COVID-19 vaccination.

1. Introduction

Coronavirus disease 2019 (COVID-19) has been a major healthcare challenge in the past two years. It appeared in December 2019 in Wuhan, China, as a new type of pneumonia with symptoms such as fever, dry cough, and dyspnea, and rapidly turned into a pandemic in March 11, 2020.¹ By June 12, 2022, the number of COVID-19-afflicted patients and deaths in the world was 540,349,319 and 6,331,268, respectively. In Iran, these numbers were around 7,023,000 and 141,000, respectively.² These numbers included only individuals with positive PCR test results and false negative PCR test results should also be considered to estimate the actual COVID-19 prevalence and mortality rates. COVID-19 has seriously affected physical, mental, spiritual, and social health at personal, familial, and social levels as well as all

financial, social, and cultural activities.³

The effective management of COVID-19 and its consequences needs local and international interventions. Vaccination is one of the most basic interventions to prevent COVID-19 affliction, hospitalization, and mortality and manage its pandemic.⁴ Vaccination is effective in the management and eradication of vaccine-preventable diseases only when at least 80% of people are covered.⁵ Vaccination programs should aim at reducing not only prevalence rate, but also hospitalization and mortality rates. Therefore, all individuals who are at great risk for affliction should be vaccinated irrespective of their age.⁶ Healthcare workers (HCWs), as the frontline employees in COVID-19 care, are at great risk for COVID-19 and hence, the World Health Organization assigned them the top priority of vaccination.^{7–10}

Despite the effectiveness of vaccination in significantly reducing the

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prevalence and severity of COVID-19, some individuals, including HCWs, hesitate about receiving COVID-19 vaccine.¹¹ COVID-19 vaccine hesitancy (VH) is a prevalent problem with a prevalence rate of 20%–30% among the general population.^{12–14} VH rate among HCWs was 41% in South Africa,¹⁵ 4.4% in Thailand,¹⁶ and 40.8% in the United States.¹⁷

As HCWs are a reliable source of health-related information in families and societies, their VH can negatively affect the process of COVID-19 vaccination and management. Therefore, effective VH management is essential to improve the effectiveness of COVID-19 vaccination programs.^{16,18–20} VH among HCWs has different contributing factors such as age, gender, perceived COVID-19 severity, perceived personal susceptibility,^{16,18} health-related beliefs, conspiracy theory, and concerns over vaccine effectiveness.^{19,20} Other common contributing factors for VH include organizational role, trust in the religious compatibility of vaccines, perceived benefits of vaccination, belief in the necessity of vaccination to protect others, and considering vaccination as a collective attempt for disease management.^{15,16} Some studies reported VH as a prevalent culture- and religion-dependent phenomenon.^{18,20}

Despite some attempts to determine the reasons for VH, there are still no comprehensive data in this area, particularly in Iran. Therefore, the present study was designed and conducted to narrow this gap. The aim of this study was to assess the factors contributing to COVID-19 VH among HCWs in Iran.

2. Methods

2.1. Design

This cross-sectional descriptive-analytical study was conducted from August 2021 to January 2022.

2.2. Participants and setting

Study population consisted of all 8000 HCWs with or without the history of COVID-19 vaccination in four leading hospitals affiliated to Zanjan University of Medical Sciences, Zanjan, Iran. Based on the population size and with a confidence level of 0.05, an estimated VH prevalence rate of 50%, and a precision value of 0.04, sample size was determined to be 500 and was increased to 551 due to a potential attrition rate of 10%.

For sampling, the number of participants to be selected from each hospital was determined based on the total number of HCWs in that hospital. Then, sampling interval was determined and HCWs were randomly selected to the study through the name list of HCWs and systematic random sampling.

2.3. Instruments

Data collection instruments were a demographic questionnaire and a COVID-19 VH questionnaire. The items of the demographic questionnaire were on age, gender, work experience, educational level, organizational role, history of direct care provision to patients with COVID-19, history of influenza vaccination, COVID-19-related knowledge, history of affliction by COVID-19, history of COVID-19 vaccination, relatives' or colleagues' death due to COVID-19, and relatives' or colleagues' death after COVID-19 vaccination.

The COVID-19 VH questionnaire was a researcher-made questionnaire with 36 items. The three main subscales of this questionnaire were inaccurate understanding of COVID-19 (items 1–8, 10, 12, and 13), inaccurate understanding of COVID-19 vaccine and its side effects (items 9, 11, and 14–32), and sociocultural barriers to COVID-19 vaccination (items 33–36). Items were scored on a five-point scale from 1 (“Completely disagree”) to 5 (“Completely agree”). The possible total score of the questionnaire was 36–180 with higher scores showing higher VH. The total score was classified and interpreted as follows:

36–72: low VH; 73–108: moderate VH; and 109–180: high VH. Items were generated through reviewing the existing literature^{14–18,21–30} and ten experts in COVID-19 care and psychometric evaluation were asked to assess the content validity of the questionnaire. The content validity ratio and index values of the items were respectively 0.81–1 and 0.9–1, confirming the acceptable content validity of the questionnaire. Internal consistency assessment also confirmed the acceptable reliability of the questionnaire with a Cronbach's alpha of 0.89. Participants personally completed the study instruments in the presence of the second author.

2.4. Data analysis

Data were analyzed using the SPSS software (v. 20). Data description was done through the measures of descriptive statistics, namely frequency, mean, and standard deviation. The Kolmogorov-Smirnov test indicated the normality of the data and thus, the independent-sample *t*-test, the one-way analysis of variance, and the multiple linear regression analysis with the Enter method were performed to analyze the data. The level of significance was set at less than 0.05.

2.5. Ethical considerations

This study has the approval of the Ethics Committee of Zanjan University of Medical Sciences, Zanjan, Iran (code: IR.ZUMS.REC.1400.267). Participants were provided with explanations about the study aim and were informed that participation in and withdrawal from the study would be voluntary and data collection and analysis would be confidential. Informed consent was also got from all of them. Consent to publish has been received from all participants.

2.6. Findings

A total of 551 HCWs participated in this study. Their age mean was 34.40 ± 7.77 years and most of them were female (65.9%) and married (70.8%), had university education (88.6%), and had received COVID-19 vaccine (94.6%) (Table 1).

The mean score of VH was 96.29 ± 12.88 , 79.49% of participants had moderate VH, and 17.42% of them reported high VH. The mean scores of the VH subscales were 25.27 ± 5.77 for inaccurate understanding of COVID-19, 61.22 ± 9.83 for inaccurate understanding of COVID-19 vaccine and its side effects, and 9.78 ± 2.47 for sociocultural barriers to COVID-19 vaccination (Table 2). The one-way analysis of variance showed significant relationship between VH and organizational role ($P < 0.001$) and the Bonferroni's post hoc method revealed that physicians and nurses respectively obtained the lowest and the highest VH scores than other participants ($P < 0.001$).

The independent-sample *t*-test showed that the mean score of VH among participants with no chronic disease, lower COVID-19-related knowledge, no history of COVID-19 vaccination, and history of colleagues' or relatives' death after vaccination was significantly higher than their counterparts ($P < 0.05$).

The results of the multiple regression analysis with the Enter method showed that the significant predictors of COVID-19 VH were COVID-19-related knowledge ($\beta = -0.113$; $P = 0.008$) and history of COVID-19 vaccination ($\beta = 0.165$; $P < 0.001$) (Table 3).

3. Discussion

This study aimed at assessing the factors contributing to COVID-19 VH among HCWs in Iran. Findings revealed that 79.49% of participants had moderate VH and the two significant predictors of VH were COVID-19-related knowledge and history of COVID-19 vaccination. Previous studies reported that the prevalence of VH was 11.4% in Turkey,³⁴ 26% in Malt,³⁵ 28% in Egypt,³⁶ 28% in France,³⁷ and 30.7% in Palestine.³¹ The higher VH prevalence rate in the present study despite the current strict governmental obligations for vaccination in Iran may

Table 1
Participants' demographic characteristics and their relationships with COVID-19 vaccine hesitancy.

Characteristics		N (%)	Mean ± SD	Test value	P value
Gender	Male	188 (34.1)	95.43 ± 13.802	1.287	0.257
	Female	363 (65.9)	96.74 ± 12.375		
Marital status	Single	161 (29.2)	96.45 ± 13.79	0.034	.855
	Married	390 (70.8)	96.23 ± 12.50		
Educational level	Below diploma	10 (1.80)	96.9 ± 11.65	0.643	0.526
	Diploma	53 (9.60)	98.17 ± 12.05		
	University	488 (88.6)	96.07 ± 12.99		
Organizational role	Physician	22(4)	85.50 ± 10.57	7.60	<0.001
	Nurse	232 (42.1)	97.92 ± 10.54		
	Other clinical workers	144 (26.1)	94.60 ± 13.18		
	Non-clinical workers	153 (27.8)	96.96 ± 12.58		
	Yes	31 (5.6)	91.84 ± 14.61		
History of chronic disease	No	520 (94.4)	96.56 ± 12.73	3.944	0.048
	Yes	370 (67.2)	96.69 ± 12.71		
Direct care provision to patients with COVID-19	No	181 (32.8)	95.48 ± 13.22	1.08	0.299
	Yes	249 (45.2)	95.38 ± 12.52		
History of influenza vaccination	No	302 (54.8)	97.04 ± 13.13	2.267	0.133
	Yes	276 (50.1)	96.66 ± 12.88		
COVID-19-related knowledge	Low	37 (6.7)	103.41 ± 12.68	6.578	0.002
	Moderate	312 (56.6)	96.19 ± 11.65		
	High	202 (36.7)	95.15 ± 12.30		
History of affliction by COVID-19	Yes	276 (50.1)	96.66 ± 12.88	0.453	0.501
	No	275 (49.9)	95.92 ± 12.89		
History of COVID-19 vaccination	Yes	521 (94.6)	95.72 ± 12.62	19.53	<0.001
	No	30 (5.4)	106.23 ± 12.71		
Colleagues' or relatives' death due to COVID-19	Yes	196 (35.6)	96.14 ± 12.90	0.04	0.842
	No	355 (64.4)	96.37 ± 12.88		
Colleagues' or relatives' death after COVID-19 vaccination	Yes	74 (13.4)	99.47 ± 14.27	5.25	0.022
	No	477 (86.6)	95.82 ± 12.59		

Table 2
The mean score and level of COVID-19 vaccine hesitancy.

Hesitancy subscales	Mean ± SD
Total	96.29 ± 12.88
Inaccurate understanding of COVID-19	25.27 ± 5.77
Inaccurate understanding of COVID-19 vaccine and its side effects	61.22 ± 9.83
Sociocultural barriers to COVID-19 vaccination	9.78 ± 2.47
Hesitancy level	N (%)
Low (scores 36–72)	17(3.08)
Moderate (scores 73–108)	438(79.49)
High (scores 109–180)	96(17.42)

Table 3
The results of the multiple linear regression analysis to determine the predictors of COVID-19 VH

Independent variables	B	SE	Beta	t	P value
Age	0.098	0.165	0.058	0.591	0.555
Work experience	-0.053	0.168	-0.031	-0.315	0.753
Gender	1.655	1.216	0.061	1.361	0.174
Marital status	0.008	1.314	0.000	0.006	0.995
Educational level	-1.178	1.544	-0.036	-0.763	0.446
Organizational role	0.732	0.715	0.051	1.024	0.306
History of chronic disease	4.616	2.402	0.083	1.922	0.055
Direct care provision to patients	-1.061	1.341	-0.041	-0.791	0.429
Direct care provision to patients with COVID-19	-1.542	1.402	-0.056	-1.100	0.272
History of influenza vaccination	1.433	1.113	0.055	1.287	0.199
COVID-19-related knowledge	-2.472	0.933	-0.113	-2.650	0.008
History of affliction by COVID-19	-0.494	1.125	-0.019	-0.439	0.661
History of COVID-19 vaccination	9.364	2.438	0.165	3.841	0.000
Colleagues' or relatives' death due to COVID-19	0.716	1.190	0.027	0.602	0.548
Colleagues' or relatives' death after COVID-19 vaccination	-2.887	1.659	-0.076	-1.740	0.082

be due to the fact that this study was conducted after the dissipation of the delta COVID-19 wave. After the COVID-19 waves, people usually showed limited adherence to COVID-19 prevention protocols and refused vaccination because they believed that a new wave would never happen. Another explanation for the higher VH prevalence in the present study compared with previous studies is that most of those studies assessed individuals' attitudes during the period of COVID-19 vaccine production, testing, and approval, while our participants had free access to COVID-19 vaccination services. Behavior modification is much more difficult than attitude modification and positive attitude about a behavior does not necessarily lead to engagement in that behavior. In fact, vaccination is part of a wider social world and hence, many different factors such as previous health-related experiences, family history, sense of control, and peer opinions can affect individuals' vaccination-related decisions.³² Therefore, vaccination-related decisions should be studied according to the immediate sociocultural context³³ and strategies for improving public trust in vaccines should be congruent with the unique political, social, cultural, and financial conditions of each country.²⁵

Study findings also indicated that physicians had the lowest and nurses had the highest COVID-19 VH. Previous studies also reported significant relationship between organizational role and VH.^{27,34–36} Two studies also showed that compared with physicians, nurses and nurse assistants had greater VH.^{30,37} The highest rate of VH among nurses may be attributed to their risk underestimation,^{38,39} their limited trust in vaccine effectiveness, or their fear over the side effects of vaccines. At the time of this study, there were limited data about the effectiveness of COVID-19 vaccines and about the results of the third rounds of vaccine testing clinical trials. As HCWs with high VH are less likely to encourage their clients to receive COVID-19 vaccine,^{26,40} such data limitation is a big shortcoming and should be overcome to help HCWs choose the most effective vaccine.^{41,42}

We also found lower VH among HCWs with a history of chronic disease, which may be due to the higher prevalence and mortality of COVID-19 among them.⁴³ Given the higher VH among healthy individuals, governmental authorities may need to use some incentives or restrictions to require them to receive vaccine and thereby, improve vaccine coverage and effectiveness. The incentives may include permission for travel, free transportation services to vaccination sites, gift cards, and tickets for sport events and concerts for individuals who receive vaccine. The restrictions may include restriction of occupational

activities for individuals with VH. Of course, incentives may be more effective than restrictions because most HCWs disagree with mandatory vaccination.³⁰ Contrary to our findings, some studies in different countries reported no significant relationship between affliction by chronic disease and COVID-19 VH.^{42–44}

Our findings also indicated higher COVID-19 VH among HCWs whose colleagues or relatives had died after vaccination. The COVID-19 pandemic and its vaccines were associated with different rumors and inaccurate information in social media. Examples of these rumors and inaccurate information were the relationship of the G5 cellular network with COVID-19, death of participants in COVID-19 vaccine trials after receiving the first dose, and consideration of COVID-19 pandemic and vaccination as biologic weapons. Such inaccurate information can increase skepticism about new vaccines, act as a major barrier to COVID-19 vaccination,^{28,44,45} and make individuals attribute ordinary deaths and events to COVID-19. Given the inadequacy of information about COVID-19 vaccines and their effects, further studies are needed to provide accurate and reliable information in this area and deny COVID-19-related rumors.

Study findings also revealed COVID-19-related knowledge as the significant predictor of COVID-19 VH. In agreement with this finding, previous studies reported that individuals with lower knowledge about COVID-19 and its vaccine had higher VH.^{46,47} A study in China also showed that individuals with lower COVID-19-related knowledge had lower trust in official media, paid lower attention to COVID-19-related information, had lower sensitivity to COVID-19 and its relevant protective behaviors, and had greater COVID-19 VH (46). These findings together with the multiplicity of the sources of inaccurate COVID-19-related information highlight the importance of providing accurate and reliable COVID-19-related information in media.⁴⁸

History of COVID-19 vaccination was the other significant predictor of COVID-19 VH in the present study so that participants with no history of COVID-19 vaccination had greater VH. Similarly, a study reported that 61.6% of HCWs who had received one dose of COVID-19 vaccine intended to receive the second dose.⁴⁹ Previous studies reported limited trust in vaccines and concerns over their side effects as two main predictors of VH.^{22,27,50}

3.1. Study limitations

This study was conducted on HCWs with an age mean of 34.40 ± 7.77 years and hence, its findings may not be generalizable to adolescents and elderly people.

4. Conclusion

This study shows moderate to high VH among HCWs, particularly nurses, and reveals COVID-19-related knowledge and history of COVID-19 vaccination as the significant predictors of VH. Given the significant influence of HCWs on the health-related behaviors of other individuals, healthcare authorities need to employ effective strategies to improve knowledge and vaccine acceptance among professional and non-professional HCWs. Interventional studies are also recommended to evaluate the effects of education on their knowledge and public rumors about COVID-19 vaccine.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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